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the twisting, rotary, or cyclonic form. One of the tongues was brighter than the solar surface, and seemed to be the most brilliant at from 9.30 to 10.30 A.M., at which time the electric wave disturbed the telegraphs. Whether the solar turbulence causes terrestrial magnetic upheavals is a question that future physicists must decide.

A sun-spot maximum is drawing near, and already there are lively electro-magnetic times.

EDGAR L. LARKIN.

Knox College Observatory, July 19.

#### The Crinoid *Heterocrinus Subcrassus*.

TWO or three years since, I concluded to find out, if I could, the character of the termination of the column of the crinoid *Heterocrinus subcrassus*. Having a lower Silurian slab with about one hundred specimens of the calyx, with a great profusion of the columns diverging in every direction, I selected a column attached to its calyx, and followed it by uncovering, until I was rewarded by discovering the column diverging into well-defined roots; length of column from calyx  $12\frac{1}{2}$  inches, about  $1\frac{1}{4}$  inches under the surface.

At that time I believed that the genus *Glyptocrinus* were floaters, and devoid of bases, or roots.

About eighteen months ago something caused me to doubt that idea, and I commenced the investigation of the terminations of their columns, and now, after a great deal of work, and after many discouragements, I have been able to so far develop roots on the terminations of the columns of *Glyptocrinus neali*, *Glypt. dyeri*, and *Glypt. baeri*, that I have a specimen of each species, showing the calyx, column, and roots intact, on the slab, one slab of *Glypt. baeri* having on its surface several specimens of that character.

One character of the specimens surprised me,—the diversity of the length of the columns between calyx and roots in the specimens just mentioned, the column of *Glypt. neali*, from two to four or five inches; *Glypt. baeri*, from one-half an inch to six or eight; *Glypt. dyeri*, from one to four or five inches between calyx and roots.

I have also found a specimen of *Heterocrinus simplex*, showing calyx, column, and inverted saucer-like base, attached to another column.

DR. D. T. D. DYCHE.

Lebanon, O.

#### Professor Parker's Further Studies on the Apteryx

IN No. 435 of *Science* the writer invited attention to the very valuable contributions to our knowledge of the morphology of Apteryx that had been made by Professor T. J. Parker, F.R.S., of the Otago Museum (New Zealand). Those investigations have been continued on more extensive material, and the London Royal Society have just published in their Transactions (1892) the results, in a paper entitled "Additional Observation on the Development of Apteryx" (11 pages; two col. lith. plates, of 19 figs.). Professor Parker has kindly sent me a copy of this work, and I desire to say, in the present connection, in continuation of what already has been noted by me in my former review, that more advanced embryos of the bird under investigation (stage F<sup>1</sup>) show "the pollex is unusually large, and the fore-limb has the characters of the wing of a typical bird." Better figures are given than in the first paper, showing structures of the brain and skull, and also that one "specimen exhibits an unusual mode of termination of the notochord." In other figures (stage G') the final form of the chondrocranium, before the appearance of cartilage bones, is shown, and, what is a very interesting fact, "that in *A. oweni* there is always a solid coracoid region to the shoulder-girdle, while in *A. australis*, as far back as stage F', there is a coracoid fenestra and a ligamentous procoracoid." Finally, it is worthy of note that "in addition to the elements described in the corpus an intermedium may be present." As I have already said, the working out of these anatomical characters, in such an important form as Apteryx, will most certainly prove to be of the highest importance and use to the general comparative anatomist the world over. There could be no safer hand to accomplish it for us than that of the distinguished biologist of the Otago Museum.

R. W. SHUFELDT.

Takoma, D.C., July 24.

#### A Satellite of the Moon

I HAVE seen accounts of an attempt to discover whether the moon has a satellite, and the accounts that have reached me seem to show one serious fault in the procedure. While I am not thoroughly conversant with all the points involved, it does seem to me, that, in taking a photograph of the region in which such a satellite would be found if it exists, the apparatus should be arranged with reference to stellar motion, and leave the moon out of question. Of course, the moon would be blurred, but we are not concerned about that. The fixed stars would appear plainly on the plate, while any one that had a motion different from theirs, especially a rapid motion such as a satellite of the moon must have, would appear blurred on the plate; in which case only the blurred stars, if such occurred, need be examined with any hope of finding a satellite of the moon.

C. P. MAXWELL.

Dublin, Tex., July 20.

#### Auroral Display.

ON Saturday night, July 16, 1892, I was returning to my home in Rockville, Indiana, from Clinton, Indiana, sixteen miles southwest. Mr. Harry McIntosh, a young man of this place who had been helping me make a survey near Clinton, was riding with me in my buggy. We amused ourselves looking at a most beautiful sunset as we rode over the Lafayette and Terre Haute road, along the foot of the high hills east of the Wabash River.

When we turned eastward, over the hills toward Rockville, it began to grow dark, and most of the clouds that showed up so beautiful at sunset began to vanish, till only a few streaks of stratus clouds remained. As we were descending the west hill at Iron Creek, five miles south-west of Rockville, we saw in front of us what we supposed was the new electric light at Rockville, thrown upward and reflected from a cloud or mist. As we were ascending the hill on the east side of the creek and near its summit, we saw in our front the reflection of a great light from behind us. It was so noticeable as to cause us both to turn about on our buggy seat and look backward. There, at a bearing S. 60° W. (that is the bearing of the road, with which the light was in alignment), we saw a great white light radiating from a point at the horizon where it was brightest, right, left, and upward to a height of 10° to 15°, weakening in brilliancy as it radiated and terminated in a dark band or segment of rainbow shape, some 10° wide. The light seemed to radiate from a point a half-radius above the centre of the circle which the black segment would indicate. Above the dark segment another segment or band of light, not so bright as the one at the horizon, formed a rainbow, or arch, some 10° to 15° wide. Above that second band of light was a light haze, or mist, through which the stars could be easily distinguished. Some 10° up in that mist, and directly over the centre of the light at the horizon, was a light about as large as a man would appear to be if suspended from a balloon a thousand feet distant. It was about four times as long vertically as wide horizontally. Young McIntosh saw it first and called my attention to it, as I was watching the bright light at the horizon. When I first caught sight of it, it had the appearance of the head of a comet, only it was long vertically. When young McIntosh first saw it, it seemed to be a blaze such as a large meteor appears to carry at its front. We halted and watched it about ten minutes, during which time it (the small light) slowly faded till only its locality could barely be noticed, then suddenly loomed bright almost to a white blaze, then slowly faded as before. It would loom up in five seconds, and consume five minutes in fading away. It kept the same position all the time, for we watched its position with relation to the stars to see if it moved. At this second appearance I decided to commit the general appearance to memory so I could sketch it afterward. This little light loomed up and faded four times when the big light under it faded also and made it dark there.

I am not sure we saw this light the first time it appeared, but think we did. The small light above looked as the moon does when shining through a thin cloud, except as to the oblong shape vertically.

When the first or south-western light faded nearly out, a light

at the horizon in the south loomed up, but not so bright as the first, nor had it any of the upper characteristics of the first, nor did it last over five minutes. When this second light faded a third loomed up in the north, quite as bright at the horizon as the first, but it was obscured or cut off from our view by a stratus cloud. This cloud was about  $10^{\circ}$  above the horizon, at its under side (which, by the way, was its most northern limit). This limit, I judge from my frequent observation of clouds, was fully twenty-five miles north of us. We could see the light through one hole in the cloud near its bottom (or distant) side, and also through several thin places, but could not determine its upper shape. This third light (counting the southwestern light as the first) lasted about five minutes, when a fourth light loomed up in the north-west, and, very bright at the horizon, reached upward about  $15^{\circ}$ , lasted a few minutes, and faded out as did the others. Then one appeared in the north-east, in the direction of Rockville; but we were so near the town we were sure it was the new electric light (we had been gone a week), but on entering the town found the old gasoline lamps still doing service.

On the first appearance of these lights at the horizon, I thought I saw a flash of light, not as a blaze, but as if a mirror had been turned so as to flash the light into my face, then away so quick I could not be certain what I saw. Young McIntosh thought he saw the same flashes of light when the great lights first made their appearance.

I saw this same electrical storm (if that is what it is) in the summer of 1884, from the town of Clinton, Indiana, and in July, I think. It had all the features I have given of this, except the one in the south-west with its three lights and dark segment, herein described. The Clinton display was watched by apparently the whole population of the place, and was described by the Clinton *Argus* at the time. I reported it to the U. S. Signal Office at the time, as I was then making voluntary observations for that office.

The small light I have described as seen in the south-west, in the first light last Saturday night, is a new feature, so far as I know or can learn from my authorities. These lights occurred from about half past nine to half past ten o'clock at night.

I wish to hear from others who may have seen these lights, by letter or paper containing published account of them.

Rockville, Ind., July 17.

JOHN T. CAMPBELL.

#### BOOK-REVIEWS.

*Geological Survey of New Jersey. Annual Report of the State Geologist for the year 1891.* Trenton, 1892. Maps and plates.

To this report Professor R. D. Salisbury contributes a paper called "A preliminary paper on drift or Pleistocene formations of New Jersey." The title is somewhat misleading, inasmuch as there are few statements in it concerning the New Jersey formations. It embraces mainly an account of the nature of the drift, the formation and movements of glacial ice, the work effected by ice, and a summary of the development, movements, and work accomplished by the ice-sheet of North America. New Jersey is incidentally mentioned, and the only new contribution made is the statement concerning the discovery of the remains of a once extensive drift-deposit south of the terminal moraine. It is concluded that this was deposited by an ice-sheet previous to the formation of the great moraine; and that "the interval which elapsed between the first and the last glacial formations of New Jersey was several times as long as that which has elapsed since the last." Assistant Geologist C. W. Coman contributes an interesting paper on the oak and pine lands of southern New Jersey. The topographical survey showed that in 1888 there were only 430,730 acres of cleared land in the southern counties, against 1,326,000 acres of forest. The proportion has not been greatly altered since. Both uplands and swamps are heavily covered with timber, much of which is valuable for various purposes. "From a little distance a cedar swamp presents the appearance of a solid mass of dark green, while even when in the midst of it the eye can penetrate but a few yards among the thickly clustering, smooth, gray trunks. The gum and maple swamps are scarcely less dense, and are even more difficult to penetrate,

because of the abundance of underbrush, amid which the poison sumac, *Rhus venenata*, is sure to be encountered by the unwary. The trees are often very large, exceeding 100 feet in height. The demand for white cedar for shingles, siding, planking for boats, and such other purposes as require great durability under exposure to the weather, far exceeds the supply." Much of the uncleared land is well adapted for fruit raising and "truck" gardening, and there is still room for a large addition to the permanent population of the State.

Mr. C. C. Vermeule, the consulting engineer and topographer of the survey, gives a comprehensive review of the water supply and water power of the State, with tables of rain-fall and evaporation, and accounts of the gauging of numerous rivers. A table is also given of all the water powers, with mention of the owner, kind of mill, fall, and horse-power. It is the intention to publish the full report on water power in the State as Volume III. of the final report some time during the present year. Finally, notes are given by other hands on artesian wells, on the Passaic River drainage and the active iron mines in the State. The information given cannot fail to be of value to the inhabitants of the commonwealth.

JOSEPH F. JAMES.

*Nature Readers—Seaside and Wayside, No. 4.* By JULIA MCNAIR WRIGHT. Boston, D. C. Heath & Co. 1892. 8°. 361 p. 70 cents.

This volume is one of a series of reading-books written, the author tells us, "to direct the minds of our youth in their first studies to the pleasant ways of Natural Science." The earlier numbers of the series were devoted to lessons on the habits of animals and plants, but the present volume deals with a much wider range of subjects. The book begins with a lesson on the origin and structure of the globe and passes on to the consideration of the geological epochs and of the animals and plants that characterize them. It is, in fact, a collection of brief essays on important topics in astronomy, geology, palæontology, and zoology. The diversity of topics would seem calculated to cause confusion in the mind of a child; but this is, perhaps, an evil inseparable from the modern system of education.

Though the facts are presented in a somewhat too fanciful dress, the information is for the most part accurate, and the author has taken great pains to point out that there are exceptions to many of the general statements. She has included, so far as possible, the results of the latest investigations.

A few noticeable errors should be corrected. For example, the pig is made to figure as a typical odd-toed ungulate (p. 349). On page 300 the sperm whale is mentioned as the "Greenland sperm whale," which is, of course, misleading, as this animal is only very rarely found in Arctic waters. In another place (p. 148) the author refers to the squirrels and rats as being the first mammals to appear on the globe, a statement which no palæontologist would accept. We notice again (p. 320) that the vampire bats are described as "very large bats given to blood-sucking." This is quite erroneous, as the true vampires, *Desmodus* and *Diphylla*, are small bats, remarkable chiefly in the modification of their teeth and digestive organs.

The influence of English text-books is apparent in different parts of the volume. The common mole, for example, is described under the name of the European genus *Talpa*; although as the book is presumably intended for American children, it would have been better to mention *Scalops* or *Scapanus*, to which genera the commonest American moles belong. We can hardly find fault with our author in this instance, however, seeing that no general treatise on American mammals has been published for nearly half a century.

In the illustrations, with which the book is well supplied, artistic effect has been aimed at rather than strict accuracy; a number of them are entirely fanciful and represent only creatures of the imagination. They could be replaced to advantage, in our opinion, by figures of some of the real wonders of animate nature.

In spite of these defects the book is a good representative of its class, and the lessons will doubtless be read by children with interest and profit.

F. W. T.